

# ***NUCLEAR ENERGY RESEARCH INITIATIVE***

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## **Engineered Materials for Cesium and Strontium Storage**

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**Project Number:** 06-058

**Collaborators:** None

**Program Area:** Advanced Fuel Cycle  
Initiative

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### **Project Description**

Closing the nuclear fuel cycle requires reprocessing spent fuel to recover the long-lived components that still have useful energy content while immobilizing the remnant waste fission products in stable forms. The aqueous processes being developed under the Advanced Fuel Cycle Initiative (AFCI) are designed to perform the chemical separations of these fuel components. One of the lesser developed plans in the AFCI strategy is the post-separation immobilization of the waste stream bearing radioactive cesium and strontium.

The proposed project will use a steam reforming process to generate candidate Cs/Sr storage materials and characterize their nature and behavior. This will complement the development of large-scale steam reforming processing equipment underway at Idaho National Laboratory. The chemical precursors to the reforming system will be designed and tested to produce ceramic storage from candidates for evaluation (e.g., aluminosilicates, titanates, zirconates, and others). The ceramic products will be stable oxide powders and will be characterized to quantify their leach resistance, phase structure, and thermophysical properties. The end result will provide a design basis for large-scale process definition.

### **Workscope**

This project consists of the following two major tasks:

- Synthesize candidate ceramics for Cs and Sr storage. This includes experiments to define process variables, feed compositions, and the product form.
- Characterize the Cs/Sr bearing ceramic products. This task includes the characterization of critical behavior and attributes of the candidate compounds, such as Cs/Sr leach resistance, ceramic phase structures, and thermophysical properties.